

CLAIMS

What is claimed:

1. A detector assembly, comprising:
5 a plurality of first imaging elements having a first radiation detection characteristic; and
a plurality of second imaging elements having a second radiation detection characteristic.
- 10 2. The detector assembly of claim 1, wherein either or both of the first imaging elements and the second imaging elements comprise a scintillating material for converting x-ray radiation into photons.
3. The detector assembly of claim 1, wherein either or both of the first
15 imaging elements and the second imaging elements comprise a photoconductor element.
4. The detector assembly of claim 3, wherein the photoconductor element is made from HgI_2 .
- 20 5. The detector assembly of claim 3, wherein the photoconductor element is made from or PbI_2 .

6. The detector assembly of claim 1, wherein the first imaging elements and the second imaging elements are arranged relative to each other in a checkerboard pattern.

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7. The detector assembly of claim 1, wherein the first imaging elements are arranged in a plurality of first lines, and the second imaging elements are arranged in a plurality of second lines.

10 8. The detector assembly of claim 7, wherein each of the first lines is positioned adjacent one of the second lines.

9. A radiation projection detector for generating signals in response to a radiation beam, comprising:

15 a conversion panel configured to generate light photons in response to a radiation, the conversion panel having a plurality of first conversion elements and a plurality of second conversion elements; and

a photo detector array aligned with the conversion panel, the photo detector array comprises a plurality of detector elements, each of the detector
20 elements configured to generate a signal in response to light photons received from the conversion panel;

wherein each of the first conversion elements has a first radiation conversion characteristic, and each of the second conversion elements has a second radiation conversion characteristic.

5 10. The detector of claim 9, wherein the first conversion elements and the second conversion elements are made from different materials.

11. The detector of claim 9, wherein the first conversion elements are configured for generating light photons in response to radiation at a first energy
10 level, and the second conversion elements are configured for generating light photons in response to radiation at a second energy level.

12. The detector of claim 11, wherein the first energy level is below a k-edge of a contrast agent, and the second energy level is above a k-edge of a contrast
15 agent.

13. The detector of claim 9, wherein the plurality of the first and the second conversion elements are arranged relative to each other in a checkerboard pattern.

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14. The detector of claim 9, wherein the plurality of the first and the second conversion elements are arranged in a plurality of lines, and each of the plurality

of lines of the first conversion elements is located adjacent one of the plurality of lines of the second conversion elements.

15. The detector of claim 9, wherein the plurality of detector elements
5 comprises a plurality of first detector elements and a plurality of second detector elements.

16. The detector of claim 15, wherein the plurality of the first detector
elements are configured to generate signals in response to photons having a first
10 energy level, and the plurality of the second detector elements are configured to generate signals in response to photons having a second energy level.

17. The detector of claim 9, wherein the plurality of detector elements are
arranged in a plurality of lines, and the detector further comprising an access
15 circuit coupled to the photo detector array and configured to collect signals from two or more of the lines of the detector elements simultaneously.

18. A radiation projection detector for generating signals in response to a
radiation beam, comprising:
20 a photoconductor layer configured to generate charges in response to radiation, the photoconductor layer having a plurality of first photoconductor elements and a plurality of second photoconductor elements; and

a detector array aligned with the photoconductor layer, the detector array comprises a plurality of detector elements, each of which configured to generate a signal in response to a charge received from the photoconductor layer;

wherein each of the first photoconductor elements has a first charge
5 generating characteristic, and each of the second photoconductor elements has a second charge generating characteristic.

19. The detector of claim 18, wherein the first photoconductor elements and the second photoconductor elements are made from different materials.

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20. The detector of claim 18, wherein the first photoconductor elements and the second photoconductor elements have different thicknesses.

21. The detector of claim 18, wherein the first photoconductor elements are
15 configured for generating charges in response to radiation at a first energy level, and the second photoconductor elements are configured for generating charges in response to radiation at a second energy level.

22. The detector of claim 21, wherein the first energy level is below a k-edge
20 of a contrast agent, and the second energy level is above a k-edge of a contrast agent.

23. The detector of claim 18, wherein the plurality of the first and the second photoconductor elements are arranged relative to each other in a checkerboard pattern.

5 24. The detector of claim 18, wherein the plurality of the first and the second photoconductor elements are arranged in a plurality of lines, and each of the plurality of lines of the first photoconductor elements is located adjacent one of the plurality of lines of the second photoconductor elements.

10 25. The detector of claim 18, wherein the plurality of detector elements comprises a plurality of first detector elements and a plurality of second detector elements.

26. The detector of claim 25, wherein the plurality of the first detector
15 elements are configured to generate signals in response to charges having a first quantum level, and the plurality of the second detector elements are configured to generate signals in response to charges having a second quantum level.

27. The detector of claim 18, wherein the plurality of detector elements are
20 arranged in a plurality of lines, and the detector further comprising an access circuit coupled to the photo detector array and configured to collect signals from two or more of the lines of the detector elements simultaneously.

28. The detector of claim 18, wherein either or both of the first and the second photoconductor elements are made from HgI_2 or PbI_2 .

5 29. A radiation projection detector for generating signals in response to a radiation beam, comprising:

a first filter having a first radiation filtering characteristic;

a second filter having a second radiation filtering characteristic;

a photoconductor layer aligned with the first and the second filters;

10 a detector array aligned with the photoconductor layer;

30. The detector of claim 29, wherein either or both of the first and the second filters are made from a material selected from the group consisting of aluminum, copper, and molybdenum.

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31. The detector of claim 29, wherein the first filter has a plurality of first regions, and the second filter has a plurality of second regions.

32. The detector of claim 31, wherein the plurality of the first and the second
20 regions are arranged relative to each other in a checkerboard pattern.

33. The detector of claim 31, wherein the plurality of the first and the second regions are arranged in a plurality of lines, and each of the plurality of lines of the first regions is located adjacent one of the plurality of lines of the second regions.

5 34. The detector of claim 29, wherein a first portion of the photoconductor layer is aligned with the first filter, and a second portion of the photoconductor layer is aligned with the second filter.

35. A radiation projection detector for generating signals in response to a
10 radiation beam, comprising:

- a first filter having a first radiation filtering characteristic;
- a second filter having a second radiation filtering characteristic;
- a conversion layer aligned with the first and the second filters;
- a detector array aligned with the conversion layer;

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36. The detector of claim 35, wherein either or both of the first and the second filters are made from a material selected from the group consisting of aluminum, copper, and molybdenum.

20 37. The detector of claim 35, wherein the first filter has a plurality of first regions, and the second filter has a plurality of second regions.

38. The detector of claim 37, wherein the plurality of the first and the second regions are arranged relative to each other in a checkerboard pattern.

39. The detector of claim 37, wherein the plurality of the first and the second
5 regions are arranged in a plurality of lines, and each of the plurality of lines of the first regions is located adjacent one of the plurality of lines of the second regions.

40. The detector of claim 35, wherein a first portion of the conversion layer is aligned with the first filter, and a second portion of the conversion layer is aligned
10 with the second filter.